Environmental Restoration Program
Final Proposed Plan

142nd Fighter Wing
Portland Air National Guard Base
Portland International Airport
Portland, Oregon

April 2003

Air National Guard
Andrews AFB, Maryland

Environmental Restoration Program
Final Proposed Plan

142nd Fighter Wing
Portland Air National Guard Base
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April 2003

Prepared For:

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
ANG	Air National Guard
ANGB	Air National Guard Base
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Contaminant of potential concern
CRSA	Columbia River Sand Aquifer
EE/CA	Engineering Evaluation/Cost Analysis
ERM	Environmental Resources Management
ERP	Environmental Restoration Program
FS	Feasibility Study
HRA	Human health risk assessment
IRA	Interim remedial action
µg/L	Micrograms per liter
MNA	Monitored natural attenuation
ODEQ	Oregon Department of Environmental Quality
PA	Preliminary Assessment
PCB	Polychlorinated biphenyl
PIA	Portland International Airport
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

SECTION 1.0

INTRODUCTION

This Proposed Plan identifies the proposed actions at areas of the Portland Air National Guard Base (Portland ANGB) in Portland, Oregon, that were investigated as part of the Air National Guard's (ANG's) Environmental Restoration Program (ERP). The remedial alternatives evaluated for use at the Base are described, and the preferred alternatives for addressing contaminated media are presented for areas where further action has been determined necessary. The rationale for selection of the preferred alternatives also is presented.

This document is issued by the ANG as part of the ERP. The ANG is the lead agency responsible for cleanup of the Base. The support agency for cleanup is the Oregon Department of Environmental Quality (ODEQ). The ANG will select final remedies for the various areas of the Base after reviewing and considering information submitted during a 30-day public comment period. The ANG will prepare responses to comments received, and will route them for ODEQ review and concurrence, prior to selecting the final remedies. Based on feedback it receives, the ANG may modify the preferred alternative for a given area or select one of the other alternatives described in this Proposed Plan. Therefore, the public is encouraged to review and comment on the remedial alternatives described herein.

The ANG is issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan. This Proposed Plan summarizes information that can be found in greater detail in the Final Remedial Investigation (RI) Report (Environmental Resources Management [ERM] 2001a) and the Final Feasibility Study (FS) Report (ERM 2001b). The remedial alternative development and selection process described in this Proposed Plan is discussed in more detail in the Final FS Report.

SECTION 2.0

SITE BACKGROUND

The Portland ANGB is immediately south of the Portland International Airport (PIA) in Portland, Oregon, between the Columbia River to the north and the Columbia Slough to the south (Figure 1). The Base occupies approximately 245 acres of land leased from the Port of Portland. It is bordered on the west by facilities of the PIA. The areas south and east of the Base are zoned for residential, industrial, and commercial use. A City of Portland municipal well field is southeast of the Base; the western boundary of the well field is approximately 1 mile from the Base.

The 142nd Fighter Wing began operations in 1941 at the present location of the Portland ANGB, which functioned as an Army Air Base until 1945. In approximately 1947, the Base was converted to an ANG facility and in 1950 it was converted to a United States Air Force Base. In 1964, control of the Base reverted to the ANG, and the Base has maintained this status to the present time.

The major support operations at the Portland ANGB that use and dispose of hazardous wastes/hazardous materials include aircraft, vehicle, and equipment maintenance, facilities maintenance, and petroleum, oil, and lubricants management. These activities generate varying quantities of waste oils, recovered fuels, and spent cleaners, solvents, and acids.

ERP investigations were initiated at the Portland ANGB in 1987. The purpose of the investigations was to: (1) determine whether contamination is present in soil, sediment, groundwater, and/or surface water as a result of past hazardous material handling and disposal practices; (2) characterize the nature and extent of any contamination discovered; (3) evaluate the associated risks to human health and the environment; and (4) develop and evaluate remedial alternatives for ERP sites requiring further action to mitigate risks.

The ERP investigations began with a Phase I Records Search (Preliminary Assessment [PA]) in 1987. Since the PA was completed, there have been two major investigation phases: a Site Investigation completed in 1991, and an RI completed in 2000. The majority of the soil, groundwater, surface water, and sediment sampling was completed during the RI. The RI consisted of several distinct field investigations and data evaluation studies. Each successive investigation built upon and supplemented the information obtained during

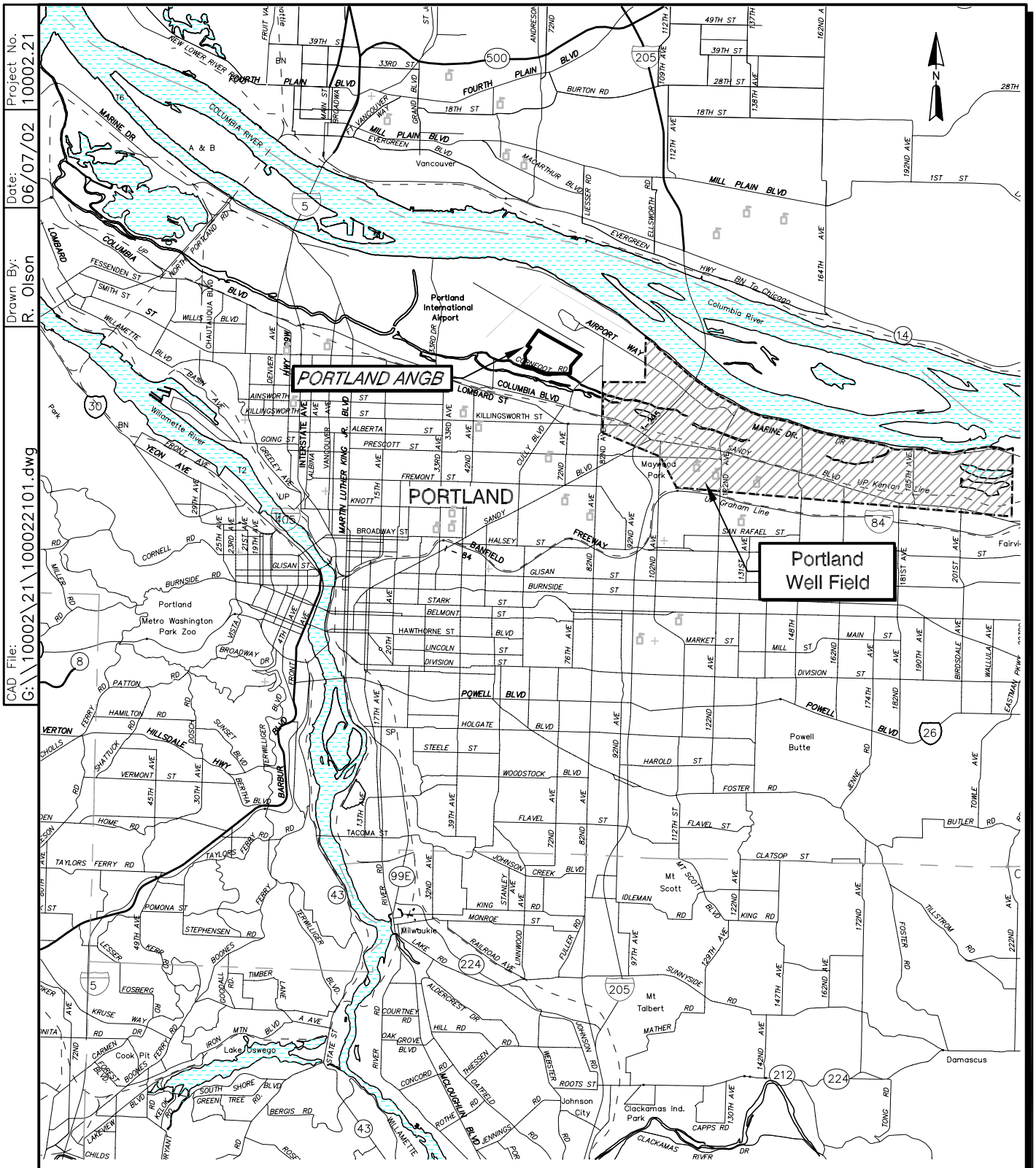

Figure 1

Location of Portland Air National Guard Base

142nd FW, Portland ANGB

Portland International Airport

Portland, Oregon

ERM 06/02

previous investigations. The Final RI Report represents the culmination of the site-characterization effort. In addition, quarterly groundwater monitoring has been performed at the Base since January 1997.

Initial field sampling activities for the RI were completed in 1996. A draft RI report was prepared following this initial sampling effort, and data gaps in the site characterization were identified. These data gaps were addressed through additional sampling performed in 1997 as part of a Remedial Investigation/Data Gap Evaluation, and in 1998 through 2000 as part of a second RI phase and an Engineering Evaluation/Cost Analysis (EE/CA). The initial RI work completed in 1996 was subsequently designated as the Phase I RI. The RI work conducted between 1998 and 2000 is known as the Phase II RI.

The Phase II RI field work was completed in two stages. The first stage was conducted between January and April 1998. Several data gaps were identified after the first stage was completed. These data gaps were addressed during the second stage of field work, performed between September and November 1999.

The following sites were investigated during the RI:

- ERP Site 1 - Central Hazardous Waste Storage Area;
- ERP Site 2 - Civil Engineering Hazardous Material Storage Area;
- ERP Site 3 - Hush House Area;
- ERP Site 4 - Main Drainage Ditch;
- ERP Site 5 - Aerospace Ground Equipment Maintenance Shop;
- ERP Site 7 - Burn Pit Area;
- ERP Site 8 – Sanitary Landfill
- ERP Site 9 – Petroleum, Oil, and Lubricants Facility;
- ERP Site 10 - Equipment Washrack; and
- ERP Site 11 (former ERP Site 6) - Washrack West of Building 250.

The locations of the ERP sites are shown in Figure 2. ERP Site 11 was originally identified as Site 6 in the PA report (HMTC 1987). ERP Site 6 was subsequently designated as ERP Site 11 during the Phase I RI (OpTech 1996a). All of the ERP sites are within the Portland ANGB boundary except ERP Site 7 (Burn Pit Area), which straddles the eastern Base boundary.

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Drawn By: R. Olson
Date: 03/12/03
Project No. 10002.22

N

0 250 500
Scale in Feet

Site 3
Site 4
Site 1
Site 2
Site 9
Site 10
Site 11 (Former Site 6)
Site 8
Site 5
Site 7
Former Ditch

LEGEND

- ERP Site Boundary
- 270 Building ID
- 15 Ground Surface Elevation Contour (ft amsl)

Figure 2
ERP Site Location Map
142nd FW, Portland ANGB
Portland International Airport
Portland, Oregon
ERM 03/03

The RI provided recommendations for each ERP site based on the contaminant concentrations detected in various media and the associated risks. Table 1 presents a summary of the investigation findings at each of the ERP sites and the recommendations for each site. With the exception of ERP Site 4, the recommendations shown in Table 1 formed the basis for the development and evaluation or remedial alternatives in the FS. At the time the FS was prepared, the potential ecological risks associated with Site 4 were still being assessed. The Site 4 ecological risk assessment was completed in November 2002 with the submittal of the *Final Site Ecology Screening Report for Environmental Restoration Program Site 4* (ERM 2002a).

The FS evaluated remedial action alternatives for each of the ERP sites except Site 4. The Final FS Report (ERM 2001b) details the development and evaluation of remedial alternatives, and presents the preferred alternatives for remediation, where necessary. This Proposed Plan summarizes the approach and findings of the FS. It also presents two remedial alternatives and recommendations for ERP Site 4 based on the results of the ecological risk assessment.

TABLE 1

ERP Site Description Summary
142nd FW, Portland ANGB, Portland, Oregon

ERP Site	Site Name	Waste Disposal History	Nature and Extent of Contamination	Risk Assessment Results	Recommendation
1	Central Hazardous Waste Storage Area	Waste storage area for misc. wastes incl. waste oil, solvents, fuels, shop wastes, electrical transformers, and capacitors.	Low levels of TCE, PCE, and cis-1,2-DCE in Shallow Zone groundwater. Likely primary source is ERP Site 2.	Unacceptable total carcinogenic risk and noncarcinogenic hazard for hypothetical on-site residential exposure to groundwater (primarily vinyl chloride).	Soil: No further action. Groundwater: Remedial measures to prevent off-site migration and on-site exposure to groundwater with unacceptable concentrations.
2	Civil Engineering Hazardous Material Storage Area	Solvents, paint thinners, and MEK were stored in or near solvent storage shed; paint was stored in Building 1123.	VOCs not detected in soil samples. Chlorinated VOCs detected in both Shallow Zone and Deep Zone groundwater. Dissolved VOC plume extends approx. 750 feet to northwest and is approximately 400 feet wide.	Unacceptable total carcinogenic risk and noncarcinogenic hazard for hypothetical on-site residential exposure to groundwater (primarily vinyl chloride).	Soil: No further action. Groundwater: Remedial measures to prevent off-site migration and on-site exposure to groundwater with unacceptable concentrations.
3	Hush House Area	Waste oil, fuel, and solvents were stored at the Hush House on unpaved surface.	Area B: Benzene, SVOCs, TPH, and metals detected in shallow soil above PSGs near former oil/water separator. Naphthalene, benzene, and vinyl chloride detected in groundwater above PSGs. Area C: TPH detected in shallow soils.	Unacceptable total carcinogenic risk for hypothetical on-site residential exposure to soil (primarily benzo[a]pyrene and dibenz[a,h]anthracene) and groundwater (primarily benzene and vinyl chloride).	Soil: No further action. Groundwater: Remedial measures to prevent off-site migration and on-site exposure to groundwater with unacceptable concentrations.
4	Main Drainage Ditch	Petroleum and oil were reported in the Main Drainage Ditch downstream from the flight apron outfall in 1987. Ditch receives surface water runoff from adjacent facilities. No records of wastes being intentionally disposed of in the ditch.	SVOCs, TPH, and metals detected in sediment in Main Drainage Ditch above PSGs. Bromodichloromethane, antimony, cadmium, copper, lead, zinc, and cis-1,2-DCE detected in surface water above PSGs.	No unacceptable human health risks. Contaminants present locally in sediment (primarily SVOCs, PCBs, and metals) exceed Oregon ecological screening level values.	Surface water: No further action. Sediment: Remedial measures to mitigate potential ecological risks.
5	Aerospace Ground Equipment (AGE) Maintenance Shop	Spent battery acid, solvents, lubricants, antifreeze, cleaning solutions, and automobile fluids were generated at Maintenance Shop. Wastes may have been disposed of along the northern and southern fence lines. Former LUST contained heating oil.	Area A: Chloroform, 1,2-dichlorobenzene, TCE, toluene, and xylene detected in groundwater at low concentrations. Area B: 1,2-DCA, TCE, and metals detected above PSGs in surface and subsurface soil.	No unacceptable risks. One soil sample exceeded USEPA screening level for lead for an unrestricted use scenario.	No further action.
7	Burn Pit Area	Flammable liquids incl. waste oil, JP-4 jet fuel, and solvents were reportedly burned in the pit as part of fire training exercises.	BTEX, SVOCs, and TPH detected in soil in the burn pit area above PSGs. Benzene, PCE, and TPH detected in groundwater.	Unacceptable carcinogenic risk for hypothetical on-site residential exposure to soil (benzo[a]pyrene).	No further action.
8	Sanitary Landfill	Wastes incl. ordinary shop and building refuse, paint cans, oil and paint residue, batteries, and broken equipment and parts were reportedly disposed of in trenches and buried.	Soil not sampled; evidence of landfilling not confirmed. No confirmed detections of PCBs, VOCs, SVOCs, or metals in groundwater above PSGs.	No unacceptable risks.	No further action.
9	Petroleum, Oil, and Lubricants (POL) Facility	Site consisted of 12 JP-4 jet fuel USTs, 2 diesel ASTs, 1 waste oil UST, and filling stations.	Benzene, ethylbenzene, and PAHs in groundwater detected above PSGs.	Unacceptable total carcinogenic risk for hypothetical on-site residential exposure to soil (benzo[a]pyrene) and groundwater (primarily benzene and PAHs). Unacceptable noncarcinogenic hazard for hypothetical on-site residential exposure to groundwater (primarily benzene).	Soil: No further action. Groundwater: Remedial measures to prevent off-site migration and on-site exposure to groundwater with unacceptable concentrations.
10	Equipment Washrack	Liquids from equipment washing operations discharged via drain pipe to a roadside ditch.	Antimony, cadmium, lead, and selenium detected above PSGs in soil.	No unacceptable risks. One soil sample exceeded USEPA screening level for lead for an unrestricted use scenario.	No further action.
11	Washrack West of Building 250	Liquids from aircraft washing operations flowed from washrack area to the catch basin of the oil/water separator. Prior to removal, cracks were noticed in the oil/water separator.	Soil: Chlorinated VOCs, BTEX, TPH, and metals in area of former oil/water separator. Groundwater: VOCs and petroleum hydrocarbons in Shallow Zone; extend to northwest. Benzene, 1,2-DCA, cis-1,2-DCE, and vinyl chloride detected above PSGs in Deep Zone.	Unacceptable total carcinogenic risk and noncarcinogenic hazard for hypothetical on-site residential exposure to groundwater (primarily benzene, 1,2-DCA, and vinyl chloride).	Soil: In-situ treatment. Groundwater: Remedial measures to prevent off-site migration and on-site exposure to groundwater with unacceptable concentrations.

NOTES:

bgs - Below ground surface
ft - Feet
LUST - Leaking underground storage tank
RI - Remedial Investigation
MEK - Methyl ethyl ketone
PSG - Remedial Investigation project screening goal
UST - Underground storage tank
SVOC - Semivolatile organic compound
TPH - Total petroleum hydrocarbons
USEPA - United States Environmental Protection Agency
1,2-DCA - 1,2-Dichloroethane
AST - Aboveground storage tank
VOC - Volatile organic compound
TCE - Trichloroethylene
PCB - Polychlorinated biphenyl
cis-1,2-DCE - cis-1,2-Dichloroethene
PCE - Tetrachloroethylene
PAH - Polycyclic aromatic hydrocarbon
BTEX - Benzene, toluene, ethylbenzene, and xylenes

Several remediation technologies/treatment options were evaluated in the Feasibility Study report (ERM 2001b) for the ERP sites shown in blue. Groundwater contamination at ERP Sites 1 and 3 will be addressed as part of the Site 2 remedy.

SECTION 3.0

SITE CHARACTERISTICS

As discussed in Section 2.0, environmental conditions at the Portland ANGB have been investigated in several phases since 1996. The results of the basewide investigations are presented in the Final RI Report (ERM 2001a). In addition to the basewide studies, separate studies were conducted at ERP Site 4 to assess potential risks to ecological receptors. The Site 4 ecological risk assessment was completed in 2002 (ERM 2002a).

The environmental investigations at the Base defined site physical characteristics (e.g., local geology and groundwater flow conditions) and identified the types, quantities, and locations of contaminants at the various ERP sites. These investigations have indicated that:

- The unconsolidated alluvial deposits from the ground surface to a depth of approximately 48 to 60 feet below ground surface consist of interbedded silts and sands referred to collectively as the Floodplain Deposits. Within the Floodplain Deposits, there are two main water-bearing sand zones: the Shallow Zone and the Deep Zone. The Floodplain Deposits are underlain by a drinking water aquifer known as the Columbia River Sand Aquifer (CRSA). The Shallow Zone, Deep Zone, and CRSA are separated by semi-confining silt layers comprising the Floodplain Silts.

- Groundwater levels measured in most monitoring wells at the Base generally range from 2 to 10 feet below ground surface. Water levels in the Shallow Zone are controlled mainly by precipitation and surface drainage ditches (i.e., the Main Drainage Ditch and the Site 7 Ditch). The Deep Zone and CRSA are hydraulically connected to the Columbia River; hence, water levels in the Columbia River influence groundwater levels in these zones.

- Various media have been affected by the direct release or local migration of contaminants at the ERP sites. The affected media include soil, sediment, Shallow Zone groundwater, and Deep Zone groundwater. Contaminants of concern that present potential risks to human health or the environment include chlorinated volatile organic compounds (VOCs), petroleum-related VOCs, semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and heavy metals. The general areas of contamination at the sites where a cleanup action is required are depicted in Figures 3 through 6.

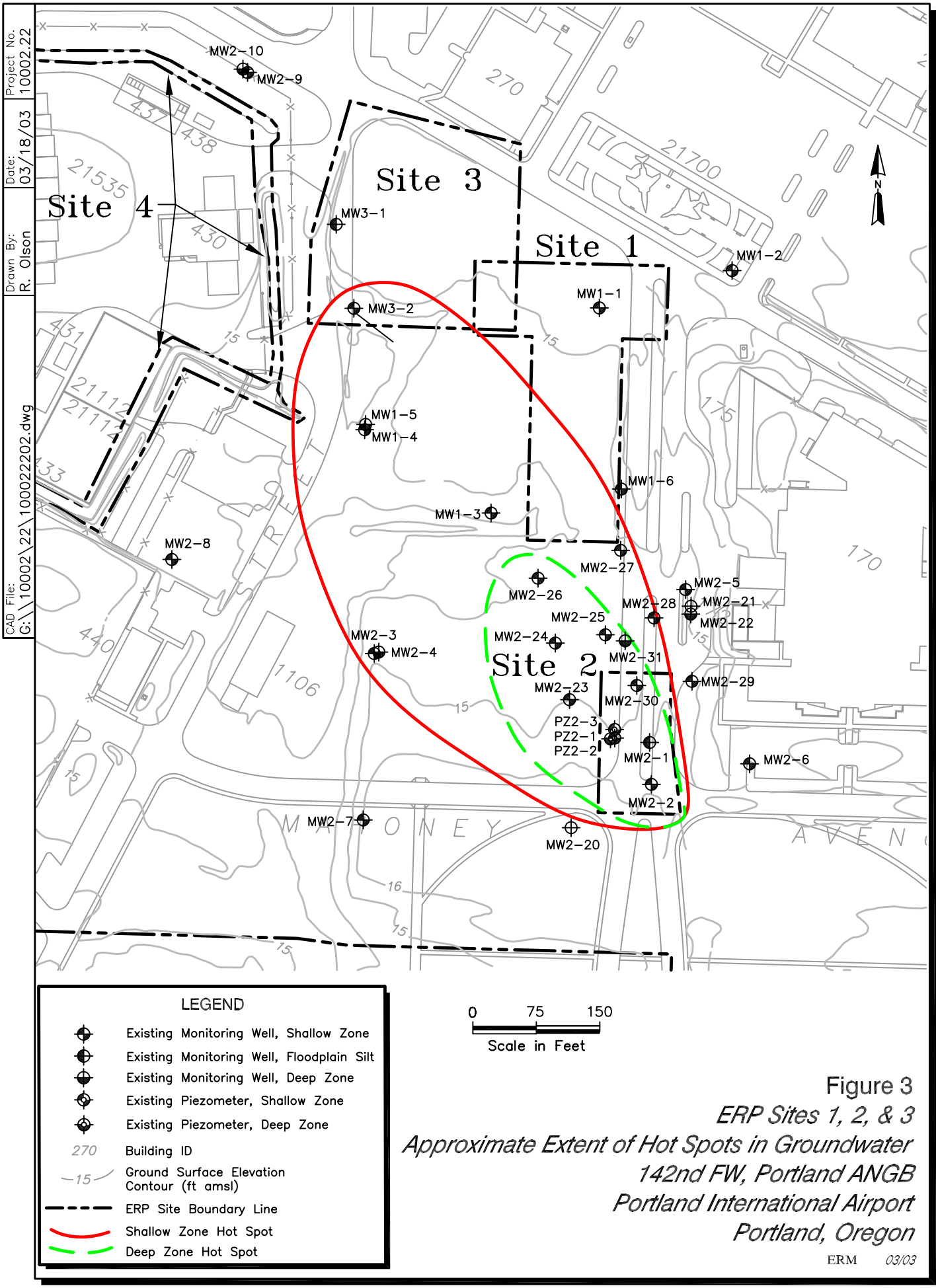

Figure 3

ERP Sites 1, 2, & 3

Approximate Extent of Hot Spots in Groundwater

142nd FW, Portland ANGB

Portland International Airport

Portland, Oregon

ERM 03/03

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Date: 11/25/02
Drawn By: J. Estrada
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0 150 300
Scale in Feet

N.E. TRANSPORT WAY

LEGEND

- SI Sediment Sampling Location (SAIC 1991)
- Phase I RI Sediment Sampling Location (OpTech 1996)
- Phase II RI Sediment Sampling Location (ERM 2001b)
- FW Ratio — Freshwater Ratio
- Bio Ratio — Bioaccumulation Ratio
- *a1* — Exceeds Freshwater Screening for Individual Constituent
- *a2* — Exceeds Freshwater Screening for Multiple Constituents
- *b* — Exceeds Bioaccumulation Screening
- *c* — Exceeds Both Freshwater and Bioaccumulation Screening
- * — Freshwater SLV Based on Apparent Effects Threshold, Marine Sediment, SQuiRTs
- ** — SLVs for PCB–1254 Used as a Surrogate for PCB–1260
- SLV — Screening Level Value
- Direction of Water Flow
- Drainline Outfall
- ERP Site Boundary

04SD–2

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Pyrene	*a2*	*210 µg/kg*	*4.0*	
Arsenic	*c*	*30 mg/kg*	*5.0*	*7.5*
Cadmium	*c*	*2.1 mg/kg*	*3.5*	*700*
Copper	*b*	*32 mg/kg*		*3.2*
Zinc	*b*	*260 mg/kg*		*87*

S4–6

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Cadmium	*b*	*0.27 mg/kg*		*90*
Zinc	*b*	*59 mg/kg*		*20*

04SD–3

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Benzo(a)pyrene	*c*	*300 µg/kg*	*9.4*	*3.0*
Benzo(k)fluoranthene	*a1*	*340 µg/kg*	*13*	
Chrysene	*a1*	*540 µg/kg*	*9.5*	
Pyrene	*a1*	*580 µg/kg*	*11*	
Cadmium	*b*	*0.44 mg/kg*		*147*
Copper	*b*	*11 mg/kg*		*1.1*
Zinc	*b*	*130 mg/kg*		*43*

S4–5

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Cadmium	*b*	*0.65 mg/kg*		*217*
Zinc	*b*	*120 mg/kg*		*40*

S4–4

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Cadmium	*b*	*0.26 mg/kg*		*87*
Zinc	*b*	*68 mg/kg*		*23*

04SD–1

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Zinc	*b*	*30 mg/kg*		*10*

S4–7

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Cadmium	*b*	*1.1 mg/kg*		*367*
Zinc	*b*	*76 mg/kg*		*25*

04SD–5

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
PCB–1254	*c*	*96 µg/kg*	*14*	*9.6*
Cadmium	*b*	*1.1 mg/kg*		*367*
Copper	*b*	*18 mg/kg*		*1.8*
Zinc	*b*	*150 mg/kg*		*50*

04SD–4

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
PCB–1254	*c*	*19 µg/kg*	*2.7*	*1.9*
Pyrene	*a2*	*76 µg/kg*	*1.4*	
Cadmium	*b*	*0.41 mg/kg*		*137*
Copper	*b*	*13 mg/kg*		*1.3*
Zinc	*b*	*83 mg/kg*		*28*

S4–1

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Cadmium	*b*	*1.6 mg/kg*		*533*
Nickel	*a1*	*120 mg/kg*	*6.7*	
Zinc	*b*	*120 mg/kg*		*40*

04SD–7

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Cadmium	*b*	*0.61 mg/kg*		*203*
Copper	*b*	*15 mg/kg*		*1.5*
Zinc	*b*	*87 mg/kg*		*29*

04SD–8

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Acetone	*b*	*360 µg/kg*		*1.2*
Antimony	*c*	*85 mg/kg*	*28*	*8.5*
Arsenic	*b*	*23 mg/kg*		*5.8*
Cadmium	*c*	*15 mg/kg*	*25*	*5000*
Copper	*c*	*190 mg/kg*	*5.3*	*19*
Lead	*c*	*550 mg/kg*	*16*	*4.3*
Selenium	*b*	*0.63 mg/kg*		*6.3*
Zinc	*b*	*460 mg/kg*		*153*

04SD–12

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Indeno(1,2,3–cd)pyrene	*a2*	*85 µg/kg*	*5.0*	
Arsenic	*b*	*13 mg/kg*		*3.3*
Copper	*b*	*13 mg/kg*		*1.3*
Zinc	*b*	*68 mg/kg*		*23*

S4–3

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Acetone	*b*	*320 µg/kg*		*1.1*
Cadmium	*c*	*2.9 mg/kg*	*4.8*	*967*
Zinc	*b*	*330 mg/kg*		*110*

04SD–10

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Benzo(a)pyrene	*b*	*130 µg/kg*		*1.3*
Indeno(1,2,3–cd)pyrene	*a1*	*87 µg/kg*	*5.1*	
Pyrene	*a2*	*260 µg/kg*	*4.9*	
Copper	*b*	*15 mg/kg*		*1.5*
Zinc	*b*	*56 mg/kg*		*19*

S4–2

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Cadmium	*b*	*0.44 mg/kg*		*147*
Zinc	*b*	*83 mg/kg*		*28*

04SD–6

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Benzo(a)anthracene	*a1*	*960 µg/kg*	*30*	
Benzo(a)pyrene	*c*	*720 µg/kg*	*23*	*7.2*
Benzo(k)fluoranthene	*a1*	*590 µg/kg*	*22*	
Chrysene	*a1*	*1200 µg/kg*	*21*	
Dibenzo(a,h)anthracene	*a1*	*190 µg/kg*	*5.8*	
Fluoranthene	*a1*	*1400 µg/kg*	*13*	
Indeno(1,2,3–cd)pyrene	*a1*	*330 µg/kg*	*19*	
Phenanthrene	*a1*	*560 µg/kg*	*13*	
Pyrene	*a1*	*1600 µg/kg*	*30*	
Arsenic	*b*	*4.3 mg/kg*		*1.1*
Copper	*b*	*23 mg/kg*		*2.3*
Zinc	*b*	*59 mg/kg*		*20*

04SD–9

Constituent	Exceeds	Concentration	FW Ratio	Bio Ratio
Benzyl alcohol*	*a1*	*3100 µg/kg*	*60*	
Benzo(a)pyrene	*b*	*110 µg/kg*		*1.1*
Di–n–butylphthalate	*b*	*510 µg/kg*		*8.5*
Indeno(1,2,3–cd)pyrene	*a1*	*160 µg/kg*	*9.4*	
PCB–1260**	*b*	*22 µg/kg*		*2.2*
Cadmium	*c*	*3.2 mg/kg*	*5.3*	*1067*
Copper	*b*	*37 mg/kg*		*3.7*
Lead	*b*	*130 mg/kg*		*1.0*
Zinc	*b*	*200 mg/kg*		*67*

FORMER FLIGHT APRON OUTFALL

ERP SITE 1 AREA OUTFALL

BLDG 455 AREA OUTFALL

Figure 4

ERP Site 4
Contaminants of Potential Ecological Concern Detected In Sediment
142nd FW, Portland ANGB
Portland International Airport
Portland, Oregon

ERM 07/02

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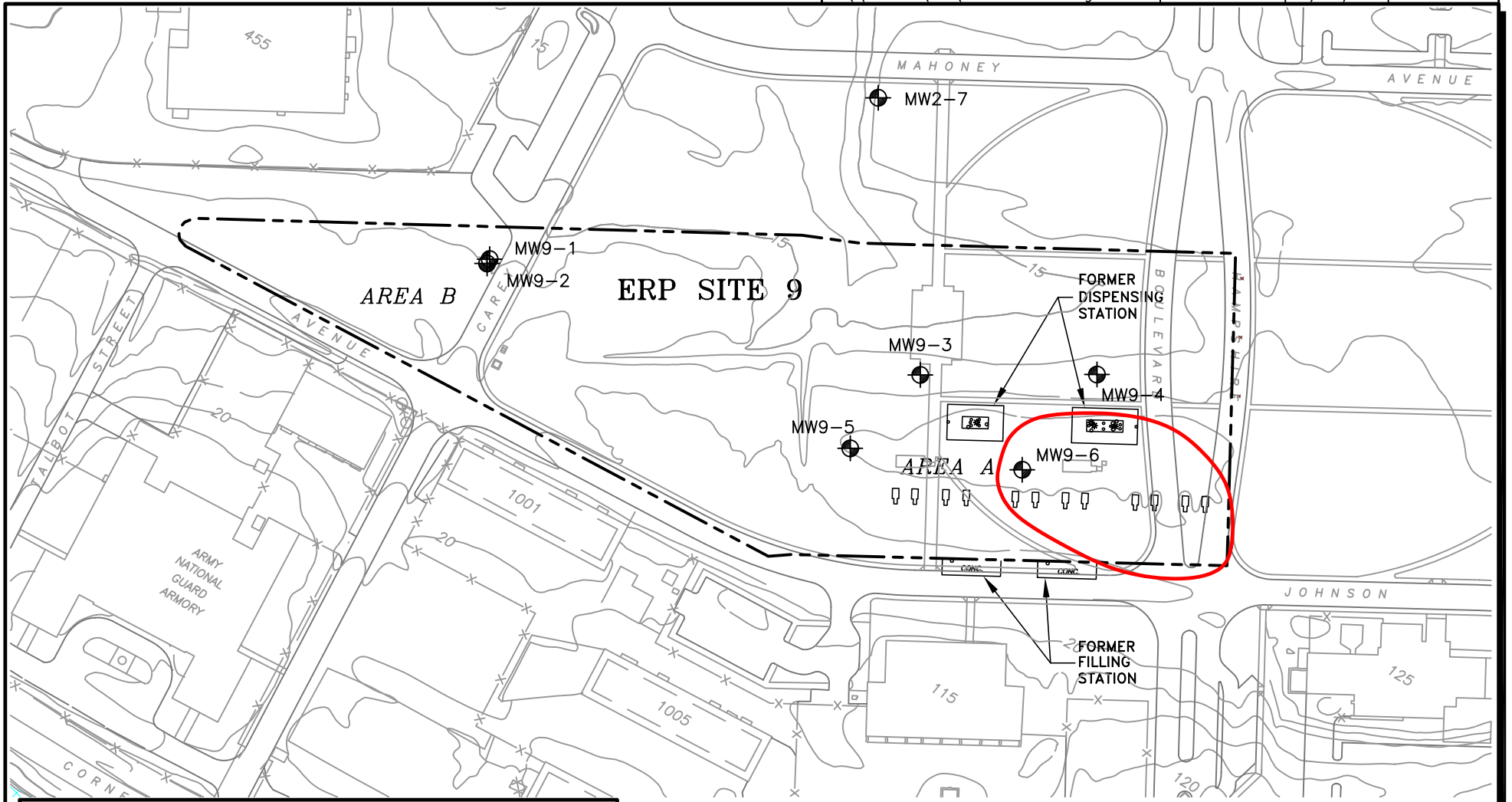

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Deep Zone
- 1113 Building ID
- Shallow Zone Hot Spot
- ERP Site Boundary
- Former 25,000-Gallon UST Location
- 15 Ground Surface Elevation Contour (ft amsl)

N

0 75 150

Scale in Feet

Figure 5

ERP Site 9

Approximate Extent of Hot Spot in Groundwater

142nd FW, Portland ANGB

Portland International Airport

Portland, Oregon

ERM 03/03

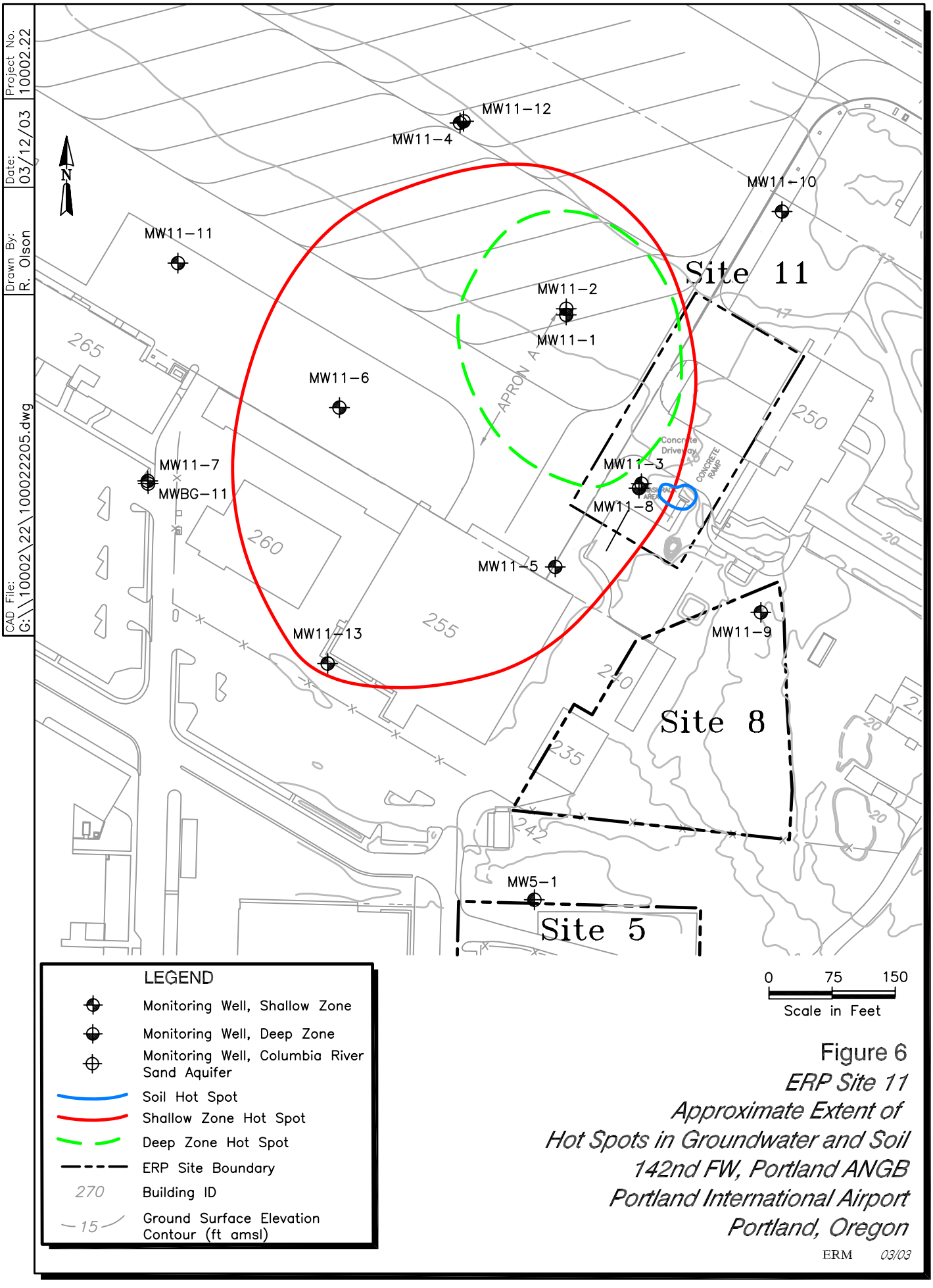

Figure 6

ERP Site 11

Approximate Extent of

Hot Spots in Groundwater and Soil

142nd FW, Portland ANGB

Portland International Airport

Portland, Oregon

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- Based on ODEQ guidance for hot spots (ODEQ 1998a), which are defined as areas of affected soil or groundwater causing a significant adverse effect on the beneficial use of the resource, portions of several ERP sites at the Portland ANGB are considered hot spots. The areas of the dissolved VOC plumes at Sites 1, 2, 3, 9, and 11 where VOC concentrations exceed ODEQ-calculated significant adverse effect levels are considered hot spots. This hot spot designation is based on the potential future migration of contaminated groundwater to an off-site drinking water resource. The extent of the groundwater hot spot areas at ERP Sites 1, 2, 3, 9, and 11 is primarily determined by the presence of vinyl chloride (Sites 1, 2, 3, and 11) and benzene (Site 9). In addition to the groundwater hot spots, the residual petroleum and VOC contaminants in soil near the former oil/water separator at Site 11 have the potential to impact the beneficial use of groundwater. Accordingly, this soil contamination also constitutes a hot spot per ODEQ guidance. Figures 3, 5, and 6 show the approximate extent of the hot spots at ERP Sites 1, 2, 3, 9, and 11.

SECTION 4.0

SCOPE AND ROLE OF RESPONSE ACTIONS

The remedial actions presented in this Proposed Plan are intended to prevent future exposure to contaminated groundwater and sediment at concentrations that would present an unacceptable risk. This will be accomplished through active treatment of contaminated groundwater and removal or capping of contaminated sediments at the Base. These actions will reduce the toxicity, mobility, and/or volume of the contaminants that constitute the principle threat to human health and the environment at each ERP site.

Interim remedial actions (IRAs) have been implemented at ERP Sites 2 and 11, and additional interim actions are planned. These actions are summarized below.

- A soil removal action was performed at ERP Site 11 in September 1999. Approximately 260 cubic yards of soil containing petroleum hydrocarbons and chlorinated VOCs was removed in the immediate vicinity of the former oil/water separator and hauled off-site to a thermal desorption facility. The scope and results of the 1999 soil removal action are detailed in the *Final Completion Report for Site 11 Interim Remedial Action Construction for Soils Media* (ERM 2000).

- An EE/CA that evaluated IRA alternatives for treating chlorinated VOCs in groundwater at ERP Site 11 was completed in June 2001 (ERM 2001d). The EE/CA also addressed residual soil contamination in the area of the former oil/water separator. The IRA that was recommended in the EE/CA consists of potassium permanganate oxidation to address contaminated groundwater and soil vapor extraction/enhanced bioremediation to address contaminated soil. The final design document for the Site 11 IRA was completed in December 2002 (ERM 2002b). Remediation at the site is expected to begin in 2003.

- Treatability tests and a full-scale demonstration test of in situ chemical oxidation were conducted as an IRA at ERP Site 2 between 2000 and 2002. The purpose of these tests was to evaluate the effectiveness of in situ remediation technologies for treating chlorinated VOCs in groundwater at the Base, and to begin cleanup of groundwater at ERP Site 2. The first phase of the project consisted of a 3-month treatability test performed in Fall 2000.

Three in situ remediation technologies were evaluated: enhanced aerobic bioremediation, ozonation, and potassium permanganate oxidation. The treatability test results are presented in the *Interim Remedial Action Construction Phase I Interim Report* (ERM 2001c). The second phase of the project consisted of a full-scale demonstration test of potassium permanganate oxidation. Field work for the demonstration test began in April 2002 and was completed in November 2002. The full-scale technology demonstration is discussed further in Section 9.0.

The remedy for the sites requiring further action will consist of a combination of focused IRAs to address immediate threats, and final actions to address residual and potential future threats. If no unacceptable risks remain at a site after an interim action is completed, the interim action can constitute the final remedy for the site.

SECTION 5.0

SUMMARY OF SITE RISKS AND RECOMMENDATIONS

The potential human health and ecological risks posed by contaminants in soil, sediment, groundwater, and surface water at the Base were evaluated as part of the RI. Potential ecological risks associated with ERP Site 4 were further evaluated in Level I (scoping) and II (screening) ecological risk assessments, conducted in accordance with Oregon guidance. The methods and results of the risk assessments are summarized below; details are provided in the Final RI Report (ERM 2001a) and the *Final Site Ecology Screening Report for Environmental Restoration Program Site 4* (ERM 2002a). The risk assessment results are summarized in Table 1.

Human Health Risk Assessment

In accordance with ODEQ's *Guidance for Conduct of Deterministic Human Health Risk Assessments* (ODEQ 2000) and the United States Environmental Protection Agency's (USEPA) *Risk Assessment Guidance for Superfund/Part A* (USEPA 1989), the human health risk assessment (HRA) followed the traditional risk assessment process defined in *Risk Assessment in the Federal Government: Managing the Process* (National Research Council 1983). This process consisted of the following four steps:

- Data evaluation / identification of contaminants of potential concern (COPCs). In this initial step, the site characterization data were reviewed and COPCs were selected for evaluation in the risk assessment.

- Exposure assessment. In the exposure assessment, populations that may be exposed to site contaminants were identified, and potential exposure pathways were defined. A complete exposure pathway requires a contaminant source, an exposure point (such as on-site soils), and an exposure route (such as inhalation, dermal contact, or ingestion).

- Toxicity assessment. In the toxicity assessment, toxicity data for individual COPCs were compiled from standard government sources for use in the risk calculations.

- Risk characterization. In the fourth step of the risk assessment, the results of the exposure and toxicity assessments were combined with Federal and State-defined risk equations to calculate estimated risk.

The populations/exposure scenarios that were evaluated in the HRA include a temporary construction/trench worker scenario, a full-time Base worker scenario, an ANG reservist scenario, and a hypothetical on-site residential scenario. Based on the current and planned future industrial use of the property, the only unacceptable human health risks identified at the site were associated with the potential future use of groundwater as drinking water. Detailed results of the HRA for each ERP site are presented in the Final RI Report (ERM 2001a).

Ecological Risk Assessment

A Level I (scoping) ecological risk assessment was conducted in accordance with ODEQ guidance (ODEQ 1998b) at each of the ERP sites evaluated in the RI. Potential sensitive ecological receptors and complete exposure pathways were identified at ERP Site 4 (Main Drainage Ditch). No ecological risks were identified at the other ERP sites. Based on the results of the Level I assessment, a Level II (screening) ecological risk assessment was performed at Site 4. The results of the Level II assessment indicate that Site 4 presents a potential ecological risk due to the presence of contaminants in sediments (primarily SVOCs, PCBs, and metals) at concentrations exceeding Oregon risk-based screening level values. Ecological receptors may be exposed to these contaminants through several pathways. For example, the contaminants can be taken up by vegetation in the ditch (e.g., grasses) and then ingested by local bird populations that forage in the ditch. Detailed results of the Level II assessment are presented in the *Final Site Ecology Screening Report for Environmental Restoration Program Site 4* (ERM 2002a).

Recommendations

General recommendations for each of the ERP sites are summarized in Table 1. These recommendations are based on the results of the human health and ecological risk assessments and current and future land use considerations.

No further action is recommended at ERP Sites 5, 7, 8, and 10. Remedial alternatives involving several different treatment options were developed and evaluated in the FS for Sites 1, 2, 3, 9, and 11. Because the ecological risk assessment for ERP Site 4 was still in progress when the FS was completed, the FS did not evaluate remedial alternatives for Site 4. Consequently, this Proposed Plan includes two remedial alternatives for ERP Site 4: (1) excavation and off-site disposal of contaminated sediment; and (2) ditch filling/capping.

The Remedial Action Objectives (RAOs), remedial alternatives, and the preferred alternatives for the ERP sites requiring further action are presented in Sections 6.0 through 9.0.

SECTION 6.0

REMEDIAL ACTION OBJECTIVES

The RAOs for the Portland ANGB address the potential risks identified at ERP Sites 1, 2, 3, 4, 9, and 11. The ANG's goal in implementing remedial actions at these sites is to reduce potential risks to acceptable levels that comply with State and Federal regulations. The RAOs are as follows:

- Restore the beneficial use of site groundwater by treating groundwater hot spots to concentrations below significant adverse effect levels (as defined by ODEQ).

- Prevent on-site exposure to groundwater containing VOCs above 10^{-6} risk concentrations for individual carcinogens. (A 10^{-6} cancer risk corresponds to a one in one million chance that a person will develop a carcinogenic response as a result of exposure to one or more carcinogens.)

- Prevent off-site migration of groundwater containing VOCs above 10^{-6} risk concentrations for individual carcinogens.

- To prevent potential future impacts to the beneficial use of groundwater, treat residual contamination in soil in the area of the former oil/water separator at ERP Site 11.

- Prevent ecological exposure to ditch sediments at ERP Site 4 that contain contaminants above acceptable risk-based concentrations.

Site-specific cleanup levels for individual contaminants and media will be presented in the Record of Decision (ROD). The ROD is the final decision document for sites that require remedial action. The Portland ANGB ROD will document the remedy selection decision and the remedial action plan for the Base, and will be prepared following receipt of public comments and any final comments from the ODEQ on this Proposed Plan.

Cleanup levels for groundwater will be based on a drinking-water beneficial use scenario. Proposed cleanup levels for the treatment of groundwater hot spots will correspond to pre-calculated significant adverse effect levels listed in Table 2-1 of ODEQ's *Final Pre-Calculated Hot Spot Look-Up Tables* (October 1998). Proposed cleanup levels for the prevention of off-site migration and on-site

exposure to groundwater containing VOCs above 10^{-6} risk concentrations will correspond to USEPA Region 9 Preliminary Remediation Goals for tap water (USEPA 2002).

If necessary (i.e., if excavation and off-site disposal is selected as the remedy for ERP Site 4), proposed cleanup levels for sediment at Site 4 will be developed during the remedial design phase and will be presented in an addendum to the ROD.

Cleanup levels for soil will not be developed. The objective of treating residual soil contamination at ERP Site 11 is to prevent potential future impacts to the beneficial use of groundwater, which will be assessed through long-term groundwater monitoring. No other soil contamination posing a potential risk to human health or the environment has been identified at the Base.

SECTION 7.0

SUMMARY OF REMEDIAL ALTERNATIVES

Six alternatives for addressing contaminated groundwater at ERP Sites 2, 9, and 11 were evaluated in the FS, including the No Action alternative (Alternative 1). As discussed in the Final FS Report (ERM 2001b), groundwater contamination at ERP Sites 1 and 3 will be addressed as part of the Site 2 remedy, since Site 2 is the presumed source of the groundwater contamination at these sites. The remedial alternatives for groundwater were developed based on a screening assessment of available technologies for treating the contaminants of concern. The technology screening and detailed analysis of alternatives for these sites are presented in the Final FS Report. The six remedial alternatives evaluated in the FS for Sites 2, 9, and 11 are summarized below. The two remedial alternatives proposed for ERP Site 4 are also presented in this section.

7.1 Alternatives for ERP Sites 2, 9, and 11

Alternative 1: No Action

The No Action alternative assumes that no active treatment measures, site modifications, groundwater monitoring, or other actions would be undertaken to prevent or eliminate risks associated with contamination in groundwater.

Alternative 2: Monitored Natural Attenuation

Alternative 2 involves the implementation of monitored natural attenuation (MNA) as the primary treatment method at each site. Implementation of MNA at ERP Sites 2, 9, and 11 would involve the periodic monitoring of both dissolved contaminant concentrations and parameters that measure the activity level of natural biodegradation processes. The duration of this alternative is expected to be approximately 30 years.

Alternative 3: In Situ Oxidation - Permanganate/Persulfate Injection with Monitored Natural Attenuation

Alternative 3 utilizes a combination of remediation technologies. The primary contaminant treatment within the hot spots would be performed through in situ

oxidation. Potassium permanganate would be used to treat chlorinated VOCs at ERP Sites 2 and 11, and sodium persulfate would be used to treat benzene at ERP Site 9. Injection of the oxidant at ERP Sites 2 and 9 would be performed through multiple temporary direct-push boreholes. Due to the active ANG flight operations in the treatment area at ERP Site 11, injection of the oxidant at this site would be performed through horizontal injection wells.

The potassium permanganate would be injected as an aqueous solution (approximately 2 percent by weight); the injection volume would vary at each site based on contaminant concentrations, soil oxidant demand, and hydrogeologic conditions. Sodium persulfate would also be injected as an aqueous solution, along with an iron catalyst to speed the reaction of the persulfate ion and benzene.

MNA would be used to measure the natural degradation of low-concentration contaminants immediately outside of the hot spots. The active treatment duration for this alternative is expected to be 2 years, followed by 5 years of monitoring.

Alternative 4: In Situ Oxidation - Ozonation with Monitored Natural Attenuation

Alternative 4 also utilizes a combination of remediation technologies. The primary contaminant treatment within the hot spots would be performed through in situ oxidation. Ozone sparging would be used as the method of oxidation. A soil vapor extraction (SVE) system would be installed to collect excess ozone and volatilized VOCs. Vertical sparging and SVE wells would be installed at ERP Sites 2 and 9. Due to the active ANG flight operations in the treatment area at ERP Site 11, horizontal sparging and SVE wells would be used at this site.

MNA would be used to measure the natural degradation of low-concentration contaminants immediately outside of the hot spots. The active treatment duration for this alternative is expected to be 3 years, followed by 5 years of monitoring.

Alternative 5: Enhanced Bioremediation with Monitored Natural Attenuation

This alternative combines the use of enhanced aerobic and anaerobic bioremediation and MNA to treat the contaminants. Areas impacted by trichloroethylene, such as the source area of ERP Site 2, would be treated using a hydrogen-releasing material. All other areas would be treated using an oxygen-releasing material. These materials would be injected through temporary direct-push boreholes, and would stimulate natural biodegradation of contaminants.

MNA would be used to measure the natural degradation of low-concentration contaminants immediately outside of the hot spots. The active treatment duration for this alternative is expected to be 2 years, followed by 5 years of monitoring.

Alternative 6: In-Well Aeration with Monitored Natural Attenuation

Alternative 6 also utilizes a combination of remediation technologies. The primary contaminant treatment within the hot spots would be performed through in-well aeration. Vertical aeration wells would be installed across the treatment area. Effluent air from the aeration wells would be treated using granular activated carbon. MNA would be used to measure the natural degradation of low-concentration contaminants immediately outside of the hot spots. The active treatment duration for this alternative is expected to be 3 years, followed by 5 years of monitoring.

7.2 Alternatives for ERP Site 4

Two alternatives are proposed for ERP Site 4: excavation and off-site disposal of contaminated sediments, and ditch filling/capping. These alternatives are described below. The ANG considers these two options to be "presumptive remedies." A presumptive remedy is a standard remedy that has been employed successfully in the past at sites where the chemical contaminants and/or site characteristics are similar to those at the site where the presumptive remedy is proposed. Based on historical documented success of both excavation/disposal and capping in reducing risks to acceptable levels at sites with shallow soil or sediment contamination, ERP Site 4 is an appropriate candidate for these two remedies. Limiting the Site 4 alternatives to these presumptive remedies will promote focused data collection during the remedial design phase, and should result in an accelerated remedy selection decision, time and cost savings, and faster site cleanup.

Alternative 1: Excavation and Off-Site Disposal

This alternative consists of excavation and off-site disposal of ditch sediments containing contaminant concentrations above site-specific cleanup levels. Proposed cleanup levels for sediment would be developed during the remedial design phase and would be presented in an addendum to the ROD. Prior to sediment removal, sediment samples would be collected from the Main Drainage Ditch to delineate the areas of the ditch requiring excavation (i.e., areas exceeding cleanup levels). Conventional earth-moving equipment (e.g., tracked excavators, backhoes, dump trucks) would be used to remove and haul

contaminated sediments. Excavated sediments would be transported to a permitted treatment and disposal facility. Following removal of contaminated sediments, confirmation samples would be collected to verify that contaminant concentrations in the remaining sediments are below cleanup levels.

Alternative 2: Ditch Filling/Capping

In this alternative, ecological risks would be mitigated by installing culvert pipe in the ditch to convey stormwater, and then filling the entire channel with clean fill material. This would effectively "cap" the contaminated ditch sediments, thereby preventing ecological exposures and eliminating potential ecological risks. In addition, filling the channel would eliminate habitat that serves as a wildlife attractant in the vicinity of the PIA. This would contribute to the Port of Portland's goal of reducing the potential for aircraft wildlife strikes at the PIA. The Port is required to undertake such measures in order to comply with Federal Aviation Administration regulations. Since the Main Drainage Ditch has been designated as a jurisdictional wetland by the United States Army Corps of Engineers, mitigation measures would be necessary to account for the loss of this wetland.

SECTION 8.0

EVALUATION OF ALTERNATIVES

In accordance with the USEPA's *Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1988) and the State of Oregon's *Final Guidance for Conducting Feasibility Studies* (ODEQ 1998c), ten criteria were used in the FS to evaluate the remedial alternatives for ERP Sites 2, 9, and 11. Both individual and comparative analyses were performed. Based on these analyses, a preferred alternative for Sites 2, 9, and 11 was selected. This section of the Proposed Plan summarizes the relative performance of each alternative against the ten criteria, and, for each site, presents a comparative ranking of the alternatives. A detailed analysis of the alternatives is presented in the Final FS Report (ERM 2001b). Summary descriptions of the evaluation criteria are provided in the table below.

The ANG considers the two alternatives proposed for ERP Site 4 (excavation / off-site disposal and ditch filling / capping) to be presumptive remedies for this site. Excavation and disposal has proven to be an efficient and cost-effective means of reducing risks at many sites such as ERP Site 4, where contaminants are limited to near-surface sediment or soil, contaminant concentrations are relatively low, the volume of contaminated material to be removed is not excessive, and the material is easily accessible. Similarly, capping the contaminated ditch sediments beneath approximately 5 to 10 feet of clean fill material (i.e., the depth of the Main Drainage Ditch) would effectively eliminate potential ecological exposures and risks. Accordingly, both alternatives are considered to be equally effective from a technical standpoint.

EVALUATION CRITERIA FOR REMEDIAL ALTERNATIVES
Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with Applicable or Relevant and Appropriate Requirements evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

EVALUATION CRITERIA FOR REMEDIAL ALTERNATIVES
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative, its effectiveness in the near term, and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operation and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the State/support agency agrees with the lead agency's analyses and recommendations as described in the RI/FS and Proposed Plan. For the independent actions conducted at the Portland ANGB, the ANG is the lead agency and ODEQ is the support agency.
Community Acceptance considers whether the local community agrees with the lead agency's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.
Treatment of Hot Spots is an ODEQ criterion that evaluates the ability of an alternative to meet the requirement to treat contaminated groundwater to below significant adverse effect levels.

Table 2 presents a qualitative comparison of the remedial alternatives evaluated in the FS, showing how each alternative ranks according to the above criteria. As a result of the evaluation process summarized in this Proposed Plan and detailed in the Final FS Report, a preferred alternative for ERP Sites 2, 9, and 11 that satisfies ODEQ guidance for the selection of cleanup actions has been identified. This preferred alternative is presented in Section 9.0, along with a brief discussion of the factors influencing the Site 4 remedy selection. The final remedies selected for ERP Sites 2, 4, 9, and 11 will be presented in the ROD, which will be prepared following a 30-day public review and comment period for this Proposed Plan (see Section 10.0).

TABLE 2

Alternatives Evaluation Summary Table
142nd FW, Portland ANGB, Portland, Oregon

ERP Site	Remedial Alternative	Evaluation Criteria									Comparative Ranking
		Overall Protection of Human Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of TMV Through Treatment	Short-Term Effectiveness	Implementability	Estimated Cost	Cost Reasonableness	Treatment of Hot Spots	
2	1. No Action	Low	Low	Low	Low	Low	High	$0	Low	Low	6
	2. Monitored Natural Attenuation	Low	Low	Low	Low	Low	High	$717,000	Low	Low	5
	3. In Situ Oxidation - Potassium Permanganate Injection w / MNA	High	High	High	High	Medium	High	$2,301,000	High	High	1
	4. In Situ Oxidation – Ozonation w / MNA	High	High	High	High	Medium	Medium	$3,501,000	Medium	High	2
	5. Enhanced Bioremediation w / MNA	Medium	Medium	Medium	Medium	Medium	High	$2,780,000	Medium	Medium	4
	6. In-Well Aeration w / MNA	Medium	High	High	High	Medium	Medium	$3,721,000	Medium	High	3
9	1. No Action	Low	Low	Low	Low	Low	High	$0	Low	Low	6
	2. Monitored Natural Attenuation	Low	Low	Low	Low	Low	High	$292,000	Low	Low	5
	3. In Situ Oxidation - Sodium Persulfate Injection w / MNA	High	High	High	High	Medium	High	$573,000	High	High	1
	4. In Situ Oxidation – Ozonation w / MNA	High	High	High	High	Medium	Medium	$1,198,000	Medium	High	3
	5. Enhanced Bioremediation w / MNA	High	High	High	High	Medium	High	$596,000	High	High	2
	6. In-Well Aeration w / MNA	High	High	High	High	Medium	Medium	$1,075,000	Medium	High	4
11	1. No Action	Low	Low	Low	Low	Low	High	$0	Low	Low	6
	2. Monitored Natural Attenuation	Low	Low	Low	Low	Low	High	$763,000	Low	Low	5
	3. In Situ Oxidation - Potassium Permanganate Injection w / MNA	High	High	High	High	Medium	Medium	$2,607,000	High	High	1
	4. In Situ Oxidation – Ozonation w / MNA	High	High	High	High	Medium	Medium	$4,409,000	Medium	High	2
	5. Enhanced Bioremediation w / MNA	Medium	Medium	Medium	Medium	Medium	Low	$4,309,000	Medium	Medium	4
	6. In-Well Aeration w / MNA	Medium	High	High	High	Medium	Low	$5,554,000	Medium	High	3

NOTES:

ARARs - Applicable or relevant and appropriate requirements

TMV - Toxicity, mobility, or volume

MNA - Monitored natural attenuation

The degree to which an alternative meets the requirements of the individual evaluation criteria is rated as low, medium, or high. The remedial alternatives for each ERP site are then ranked from 1 (highest) to 6 (lowest) based on the overall results of the alternatives analysis. For further discussion of the evaluation criteria and qualitative ratings for each alternative, see *Final Feasibility Study* (ERM 2001b).

SECTION 9.0

PREFERRED ALTERNATIVE

9.1 ERP Sites 2, 9, and 11

The preferred alternative for addressing contaminated groundwater at ERP Sites 2, 9, and 11 is Alternative 3: In Situ Oxidation - Permanganate/Persulfate Injection with Monitored Natural Attenuation. This alternative best satisfies the remedy-selection evaluation criteria utilized in the FS. Alternative 3 involves injecting an oxidant solution (potassium permanganate or sodium persulfate) through the lateral and vertical extent of groundwater impacted by VOC concentrations exceeding ODEQ hot spot criteria, combined with MNA in areas impacted at lower concentrations. The oxidant solution will spread throughout the contaminated zone, completely and permanently destroying dissolved VOCs through chemical oxidation. Detailed descriptions of permanganate/persulfate in situ chemical oxidation technology and MNA are provided in the Final FS Report (ERM 2001b). Figures 7, 8, and 9 show the conceptual plan (injection locations) for implementing Alternative 3 at ERP Sites 2, 9, and 11.

Alternative 3 is expected to achieve site RAOs within a relatively short time (i.e., 2 to 5 years). Additional benefits of this alternative include:

- The residual risk remaining after completion of the remedy is expected to be acceptable (ERM 2001b), thus human health and the environment would be protected over the long term.

- In situ oxidation using potassium permanganate for chlorinated VOCs and sodium persulfate for benzene is the simplest and most cost-effective technology among the alternatives that utilize active remedial measures.

Implementation of Alternative 3 would include the following additional measures to ensure that the remedy is protective:

- Institutional controls will be utilized as necessary during the active treatment and attenuation monitoring to prevent exposure to impacted groundwater;

- The performance and effectiveness of the remedial action will be evaluated annually; and

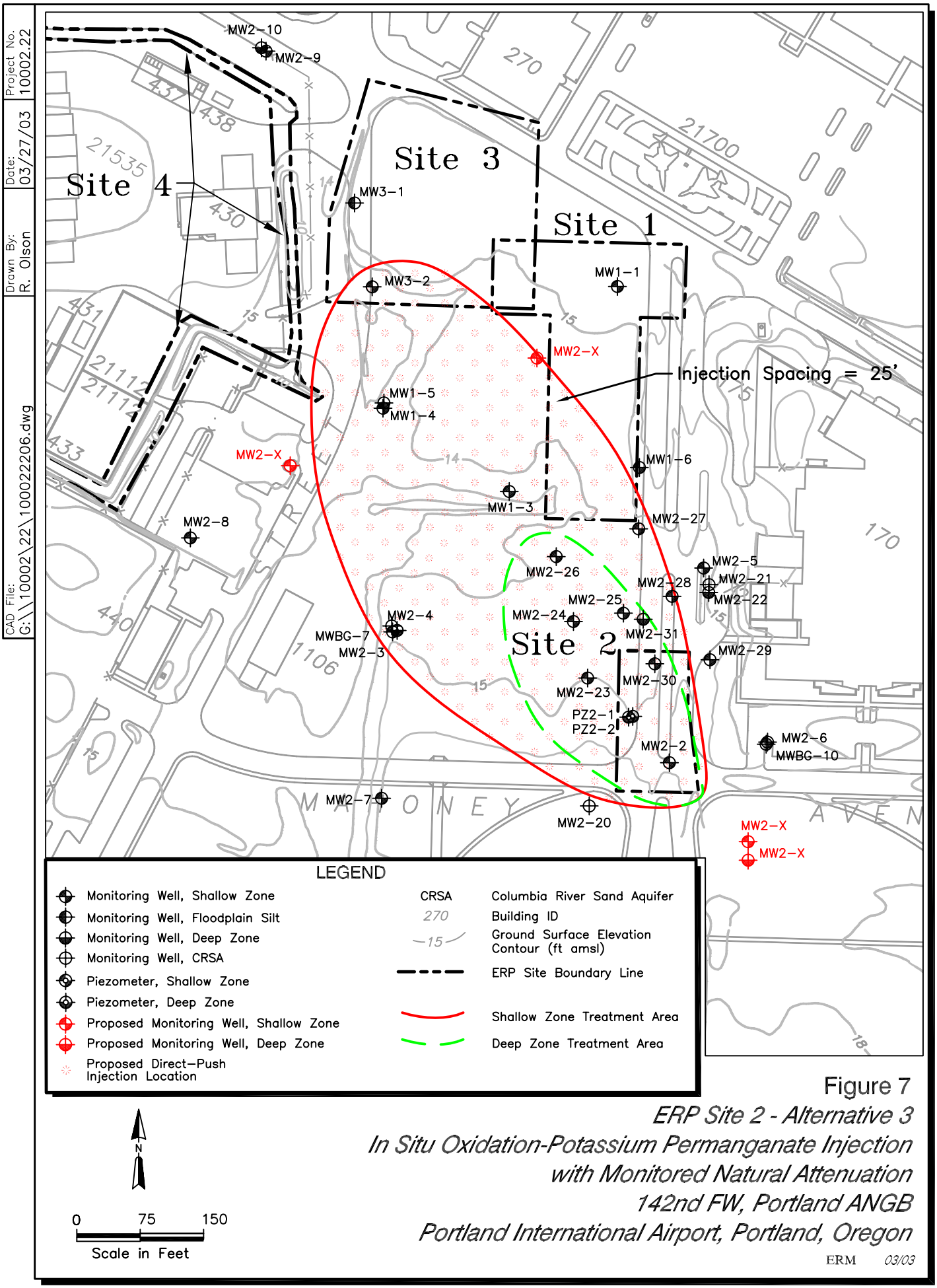

Figure 7

ERP Site 2 - Alternative 3

In Situ Oxidation-Potassium Permanganate Injection with Monitored Natural Attenuation

142nd FW, Portland ANGB

Portland International Airport, Portland, Oregon

ERM 03/03

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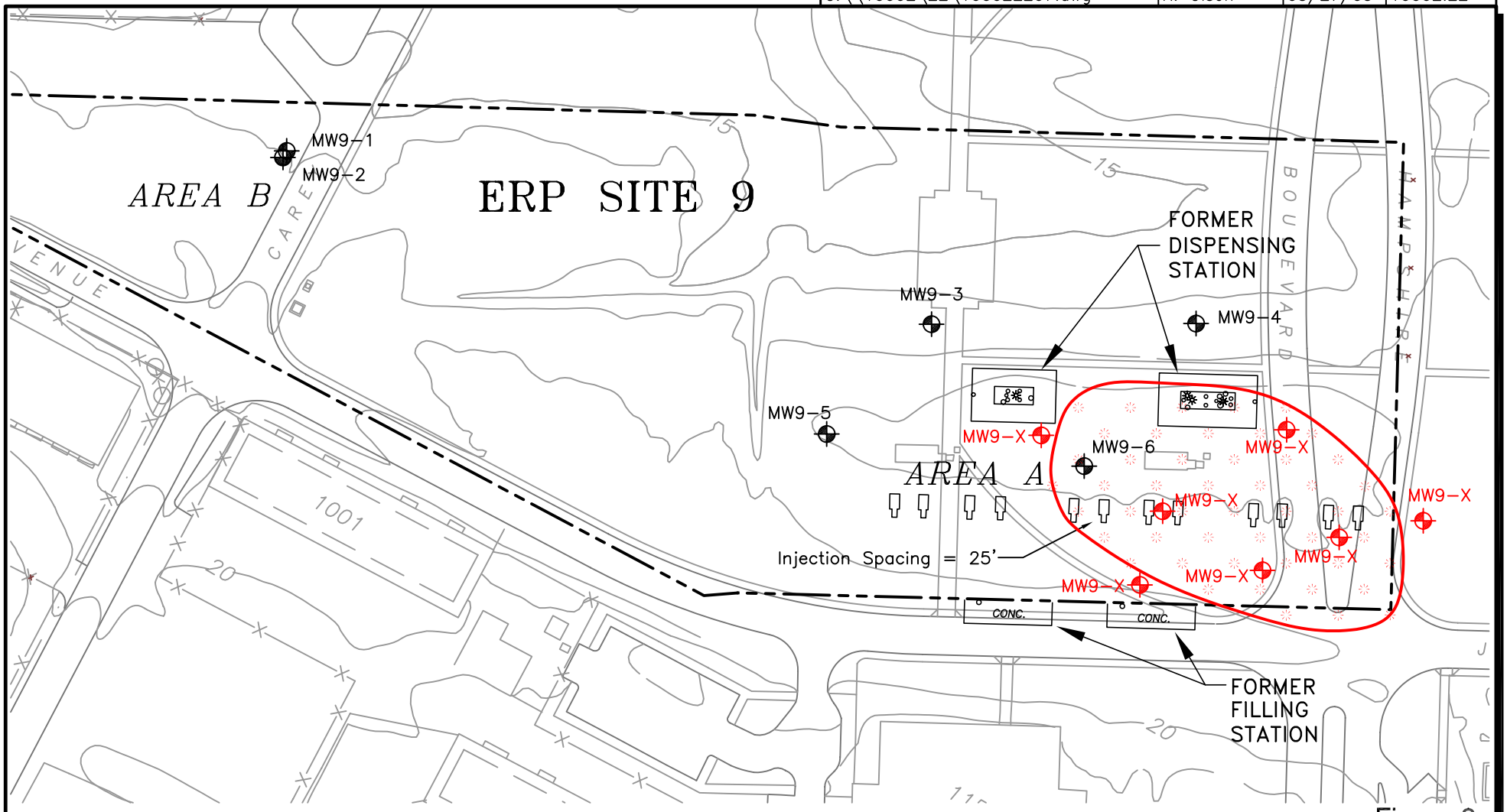

LEGEND

- Monitoring Well, Shallow Zone
- Monitoring Well, Deep Zone
- Proposed Monitoring Well, Shallow Zone
- Proposed Direct-Push Injection Location
- Shallow Zone Treatment Area
- ERP Site Boundary
- Former 25,000-Gallon UST Location
- 15 — Ground Surface Elevation Contour (ft amsl)
- 1113 — Building ID

N

0 50 100

Scale in Feet

Figure 8

ERP Site 9 - Alternative 3

In Situ Oxidation-Sodium Persulfate Injection with Monitored Natural Attenuation

142nd FW, Portland ANGB

Portland International Airport, Portland, Oregon

ERM 03/03

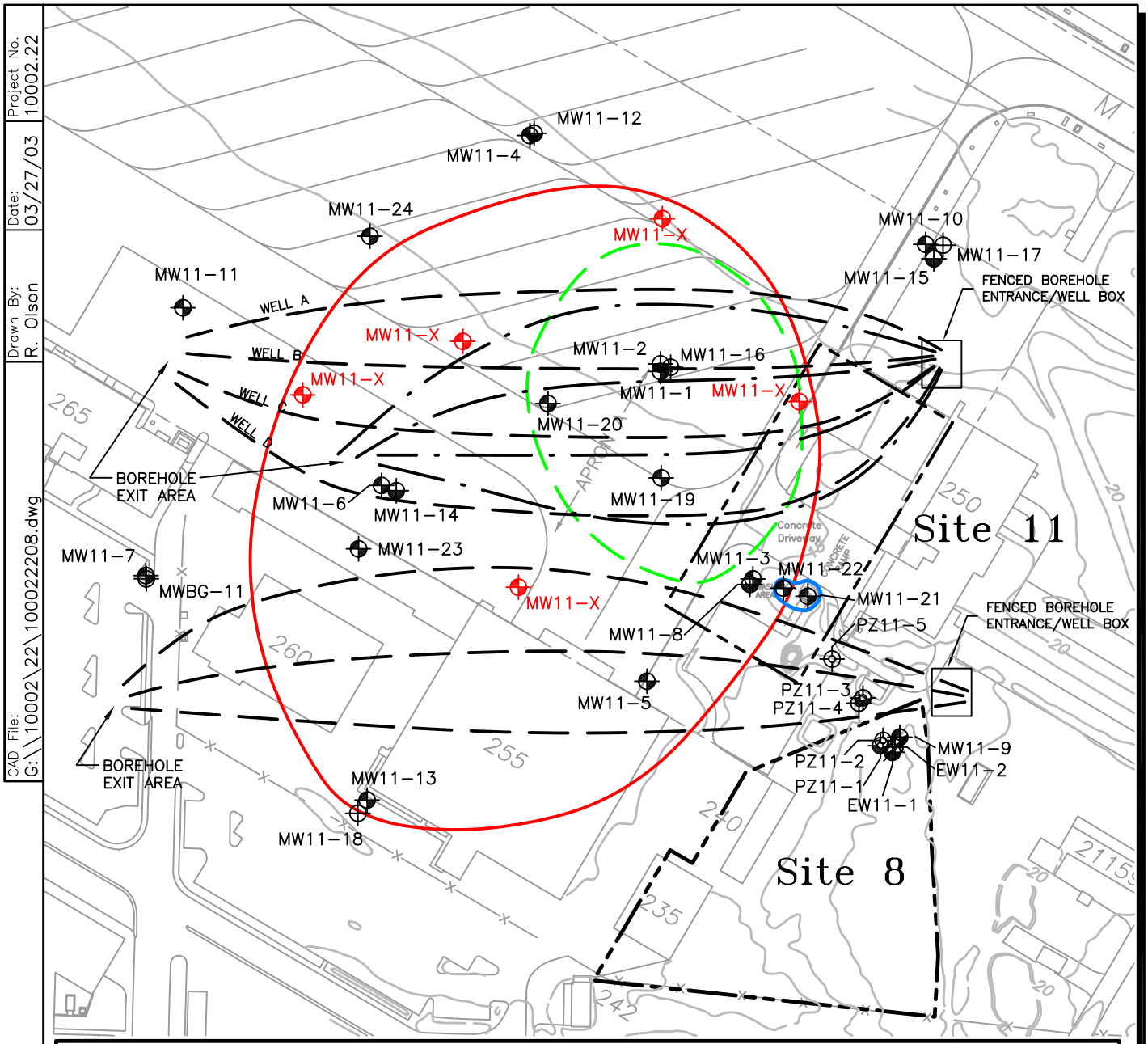

Figure 9

ERP Site 11 - Alternative 3

In Situ Oxidation-Potassium Permanganate Injection with Monitored Natural Attenuation

142nd FW, Portland ANGB

Portland International Airport, Portland, Oregon

ERM 03/03

- 5-year reviews will be conducted as necessary after the completion of the remedy to ensure that it remains protective.

A full-scale demonstration of the preferred remediation technology for ERP Sites 2, 9, and 11 - in situ chemical oxidation/permanganate injection - was recently completed as part of an interim remedial action at ERP Site 2. The demonstration evaluated the effectiveness and applicability of in situ chemical oxidation at the Portland ANGB by assessing three important performance criteria:

- The ability to deliver potassium permanganate to the affected areas, as measured by the observed physical and chemical radius of influence;

- The ability of the potassium permanganate to reduce concentrations of chlorinated VOCs; and

- The degree of adverse impacts on groundwater quality resulting from potassium permanganate injection (e.g., mobilization of heavy metals from native aquifer materials).

The technology demonstration was conducted in the area of ERP Site 2 with the highest VOC concentrations. The scope, field methods, and results of the demonstration are detailed in the *Draft Interim Remedial Action Construction Technology Demonstration Report* (ERM 2003).

The results of the technology demonstration indicate that the direct-push injection of potassium permanganate solution can provide effective treatment of chlorinated VOCs in groundwater at the Base. Sustained VOC reductions of 90 percent or greater were observed in several monitoring wells within the treatment area. However, these wells had initial VOC concentrations below 250 micrograms per liter (µg/L). In areas where VOC concentrations were on the order of 1,000 µg/L, the observed reductions were not as great, and the reductions were temporary. These results suggest that the more highly contaminated areas will require more aggressive treatment measures to achieve site-specific RAOs. Such measures might include higher oxidant concentrations, targeted injections, and/or a greater number, frequency, or density of injections.

9.2 ERP Site 4

The two proposed remedial alternatives for ERP Site 4 - excavation and off-site disposal of contaminated sediments (Alternative 1) and ditch filling/capping (Alternative 2) - are considered equally effective in mitigating potential ecological risks. In addition, both alternatives would be relatively easy to implement. Consequently, neither alternative is preferred over the other; both

would satisfy the RAO of preventing ecological exposure to contaminants above risk-based concentrations. Assuming both alternatives are acceptable to ODEQ and other stakeholders, the remedy that ultimately gets implemented at Site 4 (i.e., Alternative 1 or 2) will depend on ANG funding and contracting issues.

SECTION 10.0

COMMUNITY PARTICIPATION

A Public Information File is available for review at the Environmental Management Office of the Portland ANGB. This file contains general information on ERP activities at the Portland ANGB, as well as site-specific technical reports (including those referenced in this Proposed Plan).

Upon finalizing this Proposed Plan, the ANG will hold a 30-day public comment period to enable area residents and other interested parties to review and comment on the proposed plan of action for ERP Sites 1, 2, 3, 4, 9, and 11. Immediately prior to the 30-day comment period, the ANG will publish a public notice in the local newspaper announcing the proposed actions, the dates of the public comment period, the location of the Public Information File, the address where comments may be submitted, and a point of contact for additional information.

If sufficient community interest is shown during the public comment period, an information meeting will be held. The purpose of the information meeting will be to inform the community of the results of the ERP studies and to solicit input on the ANG's findings and proposals. The ANG will record questions, comments, and suggestions from the meeting, and will consider this information in selecting the final site remedies. If an information meeting is scheduled, it will be announced by the ANG through the placement of a display advertisement in the local newspaper.

The ANG will prepare and place in the Public Information File a "Responsiveness Summary" of the written and oral comments submitted during the public comment period and information meeting, as appropriate. The Responsiveness Summary is one of the basic components of the ROD; it will include the ANG's response to comments and explain how the ANG considered public input in reaching a final decision on its actions. If, as a result of public input, significant changes are made to the initially proposed plan of action, a second public comment period will be held.

SECTION 11.0

REFERENCES

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